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Complementarities and organizational (Mis)fit: a retrospective analysis of the Toyota recall crisis

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Abstract

During the past six decades, the Toyota Motor Company established a 'lean' production and management system (the *Toyota Way),* which has become an iconic template for a high performing and learning organization. The massive recall crisis of 2009/2010 distorted Toyota's image of a role model for a lean organization heavily. This case study analyzes retrospectively how the carmaker deviated from their original organizational configuration that was distinctive for its lean management system. We illustrate how managerial decisions geared towards extensive growth and globalization distorted complementarities among central elements of the *Toyota Way*, and ultimately caused organizational misfit. Whereas most of the literature on complementarities and organizational fit has emphasized processes of adaptation and evolution toward internal fit or misfit that are triggered by exogenous environmental changes, our case study of Toyota shows that external misfit can also be the unintended consequence of deliberate changes in the firm's system of interdependent choices.

Keywords: Toyota, Lean production, Organizational complementarities, External and internal misfit

Background

In 2009 Toyota found itself in the deepest and most dramatic crisis of its history that culminated in a recall of over 9 million cars worldwide, including 5,3 million cars in its most important North American market, due to burgeoning quality problems that involved most if its product line-up. Before the crisis, Toyota has been the unchallended leader of international automobile quality rankings for decades. The outstanding reputation for quality was grounded in the Japanese carmaker's renowned production and management system, also known as the *Toyota Way* and became world famous as *lean production*. This system was extensively studied, documented through various academic and management publications and copied within and beyond the automobile industry. The dramatic recall wave of 2009–2010, however, shed a new light on Toyota's evolution: What went wrong? What were the root causes of those recalls? Could they be anticipated?

This study sets out to investigate the root causes of the Toyota crisis starting from the conceptualization of the *Toyota Way* as a system of interconnected organizational

choices, and analyze complementarities between those choices. Following Siggelkow's complementarities framework (Siggelkow 2001; Siggelkow 2002; Siggelkow 2011), that sees the firm as a system of interconnected choices, we build on two fundamental assumptions: organizational performance derives from a) tight organizational complementarities between a firm's activity choices that reinforce mutually in a positive way (internal fit), and b) the appropriateness of a firm's system of activities with the environmental conditions that it is facing (external fit). We use this lens to interpret the incremental deviation of Toyota from the lean system it pioneered and perfected over its company's history. We show how a number of managerial decisions at Toyota loosened system-internal complementarities that led to the detrimental deviation from the original lean system. Our analysis will focus on the most central principles of lean production, i.e., built in quality, and trace internal complementarities among organizational design choices made in manufacturing, supplier management, and human resources.

Besides depicting the development of the Japanese carmaker prior to the crisis, we illustrate that organizational mis-fit is not solely determined by exogenous environmental changes with senior management failing to respond to such changes because of inertia or overconfidence, but the unintended consequence of deliberate changes in the firm's configuration of interdependent choices.

Complementarities and fit in the Toyota way

Taiichi Ohno (1988) – who is often referred to as the grandfather of the *Toyota Way* –was the first to stress the system character of lean production. Ohno emphasizes that what makes Toyota stand out is not any of the individual elements, but having all the elements together as a system and practice them every day in a very consistent manner, not in spurts. In fact, most of the "lean" literature and many of the studies of the Toyota production and management system have adopted (explicitly or implicitly) a configurational approach. Womack et al. (1990) were the first to conceive lean production as a configuration and have summarized it as a universally applicable system. Since then, the original conceptualization has evolved as a result of theory refinements and empirical studies. Lean production is a system that ought to be distinguished from the lean characterizing elements and manifestations that Sugimori et al. (1977) originally described. Some of the literature emphasizes the philosophy of lean and its underlying principles (Womack and Jones 1996; Spear and Bowen 1999); some other underline the practical and observable aspects of the related practices, tools, processes (Shah and Ward 2003). Empirical evidence for a configuration approach to lean production was first given by MacDuffie (1995) who demonstrated that the superior performance of lean production systems can be linked back both to the interrelatedness of several HR practices in an "internally consistent HR bundle" as well as the integration of that bundle with lean manufacturing policies. Shah and Ward (2007) study offers a definition of lean production as an integrated socio-technical system whose main objective is to eliminate waste by concurrently reducing or minimizing supplier, customer and internal variability. More recently, De Menezes et al. (2010) study demonstrates how the integrated application of lean practices supports the achievement of multiple goals and results in superior performance. These studies largely converge on the organizational attributes that distinguish the "lean configuration" which usually includes just-in-time production, supermarkets and kanban, quality systems, work teams, workers' multiskilling, people internal development and careers, collaborative supplier management, set-based product

engineering, and organization-wide continuous improvement. We use the construct of configuration in a formative sense (Fiss 2009), referring to the "actual" configuration or activity system of Toyota, observing the empirical manifestations of the construct and highlighting the deviations of it from the idealtype. More specifically, our case study focuses on the dynamics of such deviation.

We complement the idea of lean production as an organizational configuration drawing upon the stream of strategy research that studies the relationship between sustainable competitive advantages and the existence of complementarities within activity systems (Porter and Siggelkow 2008). This stream of research uses two related notions: "complementarities" and "performance landscape". Milgrom and Roberts (1990) define complementarities as the relationship between two or more activities implying that "doing more of any one of them increases the returns to doing more of the others". Overall, complementarity theory suggests that high performing firms are likely to combine a consistent set of activities and that the returns to such full configuration of activities are greater than the sum of the individual returns (Whittington et al. 1999). The notion of performance landscape, originally developed in evolutionary biology, was refined and formalized by Kauffman (1993). In our simplified analysis, the performance landscape is a multidimensional space in which one or more organizational outcomes (for example, business growth, market share, stock market performance and/or profitability), are causally mapped onto a set of organizational characteristics (Fiss 2007). If the set attributes are N, the performance landscape maps each set of N attributes onto performance. The appropriateness of a set of choices given environmental conditions (i.e. external fit) is represented by the height of a particular point on the landscape. If choices are complementary (i.e. internal fit), or consistent, their combination corresponds to a performance peak in the landscape. The stronger these complementarities are, the steeper is the associated peak. High internal fit results in sustained competitive advantages, as competitors will find it hard to imitate entire systems rather than individual activities (Rivkin 2000). Alternatively, a set of choices is defined to be consistent if changing any single choice, ceteris paribus, implies a performance decline.

We thus assume that the "lean production system" is an organizational configuration causally linked to high performance. The recall crisis of 2009/2010 revealed an external misfit of Toyota's lean configuration and we use the crisis as a starting point to explore the interplay and dynamics of external and internal misfit, i.e. the process of how organizations may deliberately or unintentionally deviate from a given configuration. In the next section, we will trace Toyota's organizational design choices in the 2000's based on the wealth of published material in the academic and business press on Toyota (please see Appendix) before we analyze the managerial changes that were being made that led to the distortion of internal, and ultimately, also external fit.

Case presentation

Organizational fit: Toyota's 'lean' configuration in the early 2000's

At the end of the 1990's, Toyota's organizational system had been studied and analyzed to the point of becoming the living example for lean production. This system has allowed Toyota to efficiently engineer and build high quality cars and has granted Toyota the status of being the best car manufacturer in the world.

While this section is by no means an exhaustive representation of all existing complementarities within lean production, the focus of our analysis will be on one of the most central principles in lean production – built-in-quality –and trace internal complementarities with other organizational design choices made in manufacturing, supplier management and human resources.

Built in quality and 'Andon'

A central aim of lean production is to achieve built in quality and avoid costly repairs after end assembly. One central operational practice in the *Toyota Way* to ensure this aim was pulling the Andon cord. Andon is a fixed-position line stop system (Liker 2004) that connects a cord located above the assembly line with Andons (visual boards, or panels or simple lights). When a line worker noticed an abnormality (e.g. quality defect) in a workstation he or she pulled the cord, the Andon would light up in yellow, but the line will continue moving. Until the time the vehicle moved into the next workstation, the team leader had to respond before the andon turns red and the line segment automatically stops. This was likely to be a matter of 15–30 s on an assembly line building cars at a 60" cycle time. During this time, the team leader might have immediately fixed the problem or noted how it can be fixed while the car was moving into other workstations. In this case, the team leader would pull the cord again to cancel the line stoppage. Only if the problem could not be fixed immediately, would the team leader decide to stop the line. It is important to note that Andon was more than a mere technical device but a micro-element that supported the central principle of the *Toyota Way*, i.e., built in quality (Spear and Bowen 1999). This required, however, that Andon was complemented through other organizational design choices.

Choices in manufacturing

On a more operational level Andon was supported by decentralization, i.e., the allocation of decision rights to workers and team leaders who were entitled to pull the Andon cord (and, possibly, stop the line). This had positive effects on performance because it potentially reduced quality problems. The second design choice was the standardized sequence of behaviors, coupled with artifacts (the Andon cord) that the actors involved performed. This set of routines helped prevent quality problems by avoiding the passing of defects downstream in the assembly process, without stopping production. Due to the standardization of behavioral routines actual line stoppages were reduced to a necessary minimum. This did not only affect productivity positively but also had second order effects on quality (stoppages increases frequency of errors due to workers' cognitive distraction). The third design choice was the availability of team leaders by having a small ratio of team leaders to workers (approximately 1:5). This improved the line productivity per se, for example, by covering absences or assisting workers in various ways. In fact, this operational availability was an important indicator of a shop floor's capability of keeping its production line flowing.

Choices in HRM

Additional complementarities existed between Andon and organizational design choices in HRM, which has often been considered the most central part of the Toyota system (Liker and Meier 2007; Liker 2004; Liker and Hoseus 2008). Andon required

that team leaders were carefully trained in standardized procedures on how to respond to Andon calls. Furthermore, workers needed to develop a conceptual grasp of the production process to identify problems as they appeared on the line, and the analytical skills to identify the root causes of the problems. Job-rotation helped to create a holistic understanding of the overall production process (Adler et al. 1999). The conceptual grasp of the overall production process was also a prerequisite for worker's error detection capabilities, and complementarities existed between job rotation and decentralized decision rights. Moreover, job rotation was complementary with off-the-job problem-solving activities that further helped to develop analytical skills. Distinctive of the *Toyota Way* was that workers learned to solve problems when they were actually solving problems on-the-job (Spear and Bowen 1999; Spear 2004). For example, when a worker pulled the Andon cord, the supervisor would not only repair the defect, but provided guidance to the worker on how to detect the root cause of the problem. This again created complementarities with the aforementioned operational availability of the team leader. Further, complementarities with Andon and the overarching principle of built in quality are created through other design choice in HRM, i.e., life-time employment and internal career paths that were linked to continous skill formation for team leaders and workers. Toyota recruited workers (typically highschool graduates) on the basis of fit with the Toyota culture rather than formal qualifications. Internal career paths ensured loyalty towards the company and created sustainable incentives for life-long learning (Liker and Meier 2007).

Quality problems, as detected with the practice of Andon, however, can also derive from supplier components. Thus, there is a close relation with the issue of supplier management.

Choices in supplier management

From the beginning of Toyota's company history, suppliers took over a large part of Toyota's value creation and the quality of the end product was, thus, highly dependent also on their capabilities (Fruin and Nishiguchi 1993). Toyota made relation-specific investments by offering various forms of assistance to its suppliers to help them achieve quality and efficiency targets. Lean production experts from Toyota's Operations Management Consulting Division (OMCD) frequently visited suppliers' plants to help implement lean principles (Dyer and Nobeoka 2000). Even in the US, where Toyota purchased a smaller amount of parts compared to US OEMs, Toyota sent its senior engineers to help an average of 13 days per visit, compared to only six by US OEMs (Dyer and Hatch 2006). Furthermore, Toyota also coordinated and facilitated suppliers' study groups *(Jishuken).* These were groups of suppliers that engaged on a yearly basis in the study and improvement of specific production related themes of mutual interest. The two modes of supplier development, supplier study groups and individual supplier assistance from the OMCD, can be considered complementary, as "the former gives suppliers the space to experiment and explore on their own while the latter provides a top-down quick solution by Toyota experts, which on its own may discourage learning" (Sako 2004: p. 291). The organizational design choice to separate supplier development activities of the purchasing planning division from those of the operations management consulting division (OMCD) created further complementarities as it maintained incentives for suppliers to enhance their evolutionary capabilities for the long-term, as they can be assured that their customer will not use the deep process insights they gain for commercial advantages (Dyer and Nobeoka 2000). At the same time, supplier

development activities also had the benefit of developing Toyota's own personnel in teaching tacit skills to suppliers.

Internal and external fit

Figure 1 illustrates these complementarities for the elements outlined above, resulting in high internal fit. Andon ensured built in quality and was complementary with other organizational design choices such as the decentralization of decision rights, worker's training and career systems, and supplier development activities. A major trade-off that evolved around theses choices was, however, that life-long training of workers and the establishment of supplier relations was time consuming. For example, it took about 9–10 years to develop a worker to a team leader, and another 4–5 years to reach the next higher supervisory position of a group leader. Moreover, it took about five years for a supplier to be appointed for a vehicle project and another five years until the supplier had proven himself to gain a more substantial order volume (Görtz 2006).

These obvious time disadvantages were, however, alleviated through Toyota's growth and sales strategy up to the year 2000, which made the external fit of Toyota's lean configuration apparent: In the initial phase of its global expansion, marked by Toyota's first plant openings in the US in the 1980s, Toyota relied heavily on its domestic plants to satisfy the continous growth in global consumer demand with an export rate of over 60 %. This allowed Toyota to make full use of its sophisticated but highly contextual HRM system and secure investments in internal career and training systems.

Initially, foreign sales took place mostly in the US and Toyota invested in local facilities to replicate its lean configuration system. The successful transfer of the Toyota system of supplier management and HRM in the 1990s in the US has been well

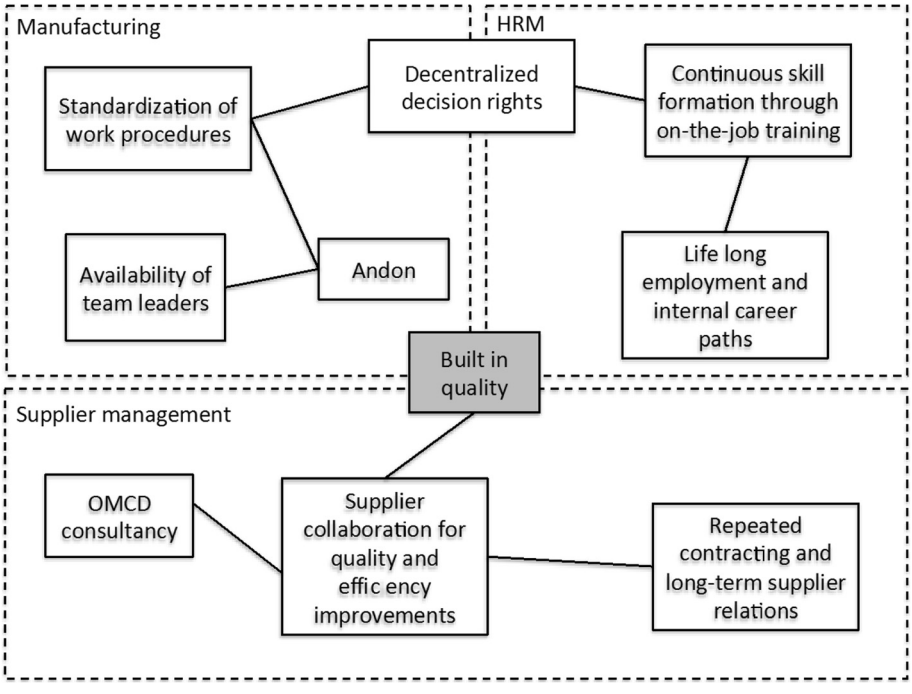

Fig. 1 Complementarities and fit between organizational choices in the Toyota Way (bold lines indicate strong complementarities between organizational choices)

researched and documented (e.g. Dyer and Hatch 2006; Dyer and Nobeoka 2000). At the same time, Toyota still manufactured around half of its global demand domestically and made use of "bridge production", i.e. exports to fill in excess U.S. demands (Chappell 2012). Thus, Toyota's sales activities were concentrated on two main regions and demand was relatively stable. Stable production levels with little fluctuations were an important prerequisite for the smooth functioning of the Toyota system with just-in-time delivery, standardized work procedures and continous improvement activities. Another factor that accounted for high external fit was relatively weak foreign competition in terms of quality, as revealed by major benchmarking studies in the automobile industry. Strong domestic competition, on the other hand, and with Nissan in particular, was often said to be an additional driving force behind the *Toyota Way* (Kawahara 1998).

The distortion of complementarities and organizational misfit between 2000 and 2010

At the end of 2009, when almost every other global carmaker was enjoying profit gains, Toyota found itself in the most dramatic crisis of its history due to burgeoning quality problems and product recalls. Searching for the causes of declining product quality, Akio Toyoda, the grandson of Toyota's founder and Toyota's current president, publicly declared that since 2003 Toyota's rapid expansion led to a state where sales grew faster than the company could manage (Shirouzu 2010). The strategic change towards faster growth was initiated in 1995 with the appointment of Hiroshi Okuda as the company's new president who oversaw the shift from conservative corporate style to aggressive management and was the driving force behind Toyota's global ascendance (Sato 2006). He was the designer of a global growth strategy, the "2005 vision", characterized by the ambition to rapidly increase Toyota's global market share from 7.3 % in 1995 to 15 % in 2010 (Cole 2011).

As a result, internationalization speed increased dramatically: In a 7-year period between 2000 and 2007 Toyota opened 18 new plants all around the world, profoundly changing the company in terms of size and geographical dispersion. Due to this extensive internationalization, Toyota became the largest car manufacturer in the world in 2008 with over 8.3 million sold vehicles. In retrospect, Toyota's rapid growth might have come at the expense of harming some of the basic principles of Toyota's management model that once were the prerequisite of the company's impressive performance.

Although Toyota initially tried to build on its principles of lifelong employment, internal career paths and continuous training also for its overseas operations, it was facing high turnover among its experienced members in its U.S. operations. An amalgation of nearly a dozen subsidiaries, including manufacturing organizations for its plants that were located at geographical distance to each other, created a high travel burden for managers: in 2005 Toyota lost ten percent and in 2006 five percent of its experienced staff (Chappell 2007). The geographic dispersion of its operations also made it hard for Toyota to ensure high quality of trainings and Steve St. Angelo, the former North America Manufacturing Chief, noted in 2010 that there are so many *Toyota Way* rules that American workers "just don't understand". The *Toyota Way* is highly tacit and, thus, relies heavily on on-the-job training. Even worse, a lot of the existing written guidelines date back from the decade when TMC was founded (Greimel 2010). Equally problematic was the fact that some of Toyota's global factories did not adhere to the company's basic creeds, like allowing workers to stop factory

lines when they spot defects and, thus, make full use of the Andon cord, as one Toyota executive diagnosed (Fackler 2007).

Toyota's expansion strategy also affected the company's global employee headcount that shot up from 183,000 to 321,000 within a decade (Greimel 2010). This massive increase did, however, create a number of problems and it became increasingly difficult for Toyota to satisfy the need for internally developed managers, technicians, supervisors and operators fully consistent with Toyota's philosophy and corporate culture. For its San Antonio plant, for example, Toyota admitted to have a tougher time than expected to find skilled manufacturing staff as it was facing the challenge of bringing in not just 2000 employees for its own production, but another 1000 employees to the various supplier lines next door (Chappell 2005). Toyota tried to react to this challenge by massively hiring temporary workers in production. The extensive use of temporary workers turned out to be highly problematic as they were not integrated in Toyota's internal career and training system and, thus, tend to be less experienced and qualified than regular workers. The lower degree of qualification harmed the execution of decentralized decision rights as temporary workers were not sufficiently trained to detect irregularities in the work process and pull the Andon Cord.

The severe consequences of the high ratio of temporary workers was illustrated in the case of Toyota Motor in the United Kingdom (TMUK) where 50 % of the experienced workforce left in the period between 1997 and 2000 as a result of excessive overtime (Pardi 2005; 2007). Filling in these vacancies with temporary workers led to a rising pressure on the remaining workforce to fulfill the ambitious productivity targets. Consequently, the level of stress in production rose and absenteeism rates climbed to a record-high of 3,11 % in 2000, exceeding the threshold of 2 % that is considered the structural limit for stable lean operations by Toyota (Pardi 2007). In order to avoid further overtime through any delay in the daily production targets, team members hesitated more and more to pull the andon cord to keep the line running. This had detrimental effects for product quality – for the Avensis, the number of defaults per vehicle doubled between 1999 and 2000 from 0.5 to 1 and for the Corolla, it rose fourfold from 0.4 to 1.6 (ibid.). Most of these defects were related to elements that were not supposed to be checked by quality teams but normally belong to the direct responsibility of team members. It became clear that the extensive use of temporary workers distorted complementarities between the organizational design choices of Andon, decentralized decision rights (due to their lower qualification and motivation to detect irregularities), and standardized work procedures (due to disruptions in the work process caused by temporary workers).

Suppliers were facing similar challenges, as most of them had to import foreign workers on temporary work visas due to the labor shortage in the Aichi prefecture. Based on his interactions during a plant tour at the Kamigo engine plant Smalley (n.d.) cited a Toyota senior manager who admitted that the labour structure has changed entirely in Japan and instead of veteran employees with 15–20 years of experience, there were around 40 % temporary employees on six-months contracts. The cited manager considered this a real challenge in terms of turn over in the work force, which has "put a real strain on Toyota and even more on the supply base" (ibid).

The distorted complementarities with the Andon system and the overarching principle of built in quality was further exacerbated by the elimination of the team

leader position in the late 1990s (Shimizu 2004). This step was internally motivated by several reasons. Partly, it was to economize on organizational structure and cost, and partly, because it became increasingly complex and costly to develop team leaders at a pace compatible with new plants' set-ups. Although the team leader position was re-introduced in 2008, there was a general tendency in overseas plants to shorten career paths for supervisory positions. Whereas it takes about 10 years in Japan to become appointed as team leader, the case of Toyoto in France (TMMF) showed that due to the high employee fluctuation, team members were often promoted to team leaders during their first three years (Pardi 2007). Once team leaders became unavailable or were at least less experienced to perform their task, this had a compounded effect on quality performance because the other elements (e.g., the decentralization of decision rights, the routine application of standardized work procedures etc.) lost their beneficial effects. Moreover, workers had fewer reasons to pull the cord (as they cannot be sure that the teamleader will come for help), or, if they did, it was more likely that the line will either stop or that the unsolved problem will pass downstream the assembly process. The need to speed up temporary workers' training process further added to the detrimental effects on quality and efficiency. This domino effect is a symptom of distorted complementarities (see also Fig. 2).

Toyota's rapid internationalization also affected complementarities among organizational choices in supplier management. Possibly triggered by the aggressive cost cutting efforts of Carlos Ghosn at Nissan, Katsuaki Watanabe, former head of purchasing and known to be a "ruthless cost cutter" (Treece 2004) announced Toyota's efficiency program CCC21 (Construction of Cost Competitiveness for the 21st Century) in 2000 that targeted an unprecedented cost reduction of 30 % of Toyota's parts prices over a five-year period. The program

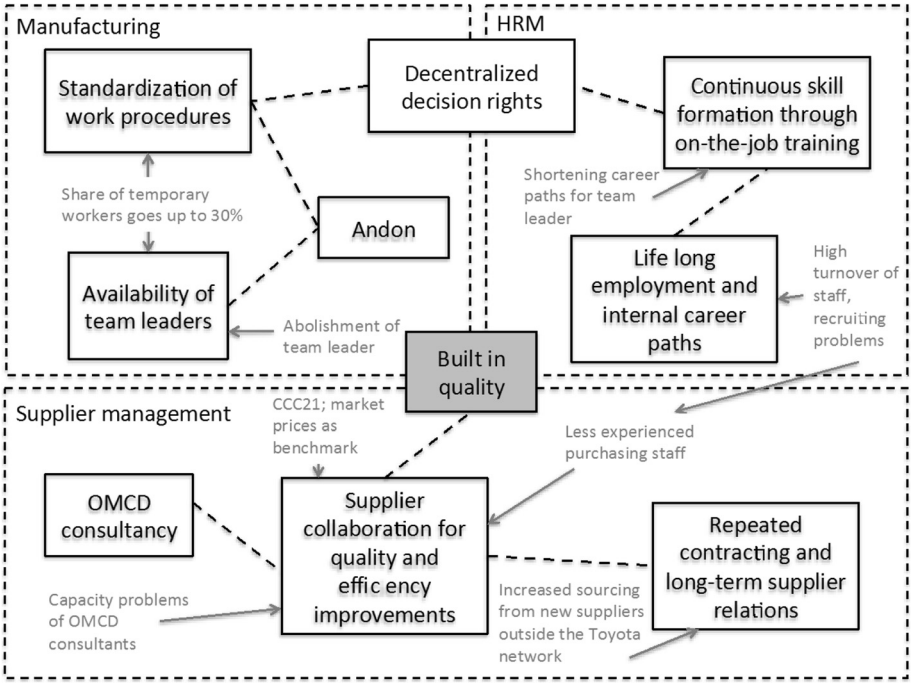

Fig. 2 Distorted complementarities and internal misfit (dotted lines indicate distorted complementarities between organizational choices)

symbolized a radical shift from the original kaizen approach of gradual cost reduction that used internal parts costs of the previous model as a reference. By contrast, CCC21 was more strongly geared towards market competition by identifying about 180 key parts that were benchmarked with parts prices for the world's most competitive suppliers of those parts – which for the first time also included suppliers in India and China (Chappell 2008). If the keiretsu suppliers did not learn how to meet the benchmark they risked losing business. The program was considered a huge success and led to savings of $10 billion in a five-year period. CCC21, thus, clearly marked a turn from Toyota's traditional principle of network-internal competition (Wilhelm 2011) towards more traditional market competition.

The item-based approach of CCC21 was further extended from 2005 to 2009 by a system-based approach under the "Value Innovation"-program. The program aimed at an additional cost reduction of 30%, mainly by cutting the number of automobile components by 50% and integrating them into more encompassing modules (Toyota Motor Corporation 2006). However, this increasingly put Toyota's network suppliers under pressure as they did not – unlike their independent Western competitors – have the integrative capabilities to develop whole modules and systems (Okamura 2005). Traditionally, Toyota has been taking the lead in its network to coordinate and integrate parts within an architectural system. For the first time, Toyota group suppliers were facing serious competition with foreign global suppliers (Okamura 2005). More work being contracted to new overseas suppliers meant "working with a lot of unfamiliar suppliers who didn't have a deep understanding of Toyota culture" (Womack cited in Greimel 2010). Sourcing from new suppliers who are less experienced with Toyota's processes became particularly problematic in combination with the internal shortage of senior engineers who could properly supervise these new suppliers according to Toyota standards (Andrews et al. 2011). More specifically, Toyota was not able to grant sufficient manufacturing assistance as there were internal capacity problems of OMCD consultants whose expertise was heavily needed in Toyota's own overses plant. As a result, suppliers felt overwhelmed with the responsibility of securing quality and reducing cost without receiving much assistance from their customer (ibid.).

Conclusion

In our retrospective analysis of Toyota's development from 2000 to 2010 we mapped out how the once strong complementarities between Toyota's organizational choices that were distinctive for the original lean configuration became distorted over time. We emphasized that this distortion of complementarities was not primarily caused by exogenous environmental changes such as an unfavorable market situation that subsequently led to external misfit, but corporate strategic choices made by Toyota's top management. Lured by market opportunities and the possibility to crown the dream to become the world's largest auto producer, Toyota's decision makers experimented with strategic changes regarding organizational growth and globalization. This resulted in a sequence of changes of organizational choices such as training and HR development systems, management selection and promotion criteria, elimination of team leader position in production, and ruthless supplier cost-cutting programs. Changing these organizational choices mis-matched the other attributes of Toyota's existing lean configuration, and specifically the operational choice of Andon, leading to the worsening of built in quality and manufacturing performance.

Our case illustrates why firms evolve through punctuated equilibrium with phases of upheaval, misfit and crisis (Siggelkow and Rivkin 2009). We provide more fine-grained insights into this process by distinguishing between managers' search for a set of consistent organizational choices that determine firm performance. We argue that a mismatch between organizational choices – as observed in the case of Toyota – may not simply be the result of the inability to adapt to environmental changes, but are unintended consequences of deliberate changes in the internal configuration of organizational choices, that – at least - co-determine external misfit.

Once the causes of organizational misfit are recognized and understood by managers, however, it is possible to amend complementatiries. Akio Toyoda publicly admitted in 2010 that the key reason for Toyota Motor Corp.'s quality problems was an excessive focus on market share and profits that warped the "order of Toyota's traditional priorities" (Shirouzu 2010). The company responded to the crisis by returning to its basic principle of *genchi genbutsu* which suggests that one needs to go to the *genba* or, the 'real place' where work is being done in order to truly understand a situation. In 2011 Akio Toyoda announced a new Global Vision that defines what kind of company Toyota aspires to be, highlighting sustainable business with fuel-efficient, environmentally friendly vehicles and stable relations with customers, suppliers, and communities. Signs of financial recovery are already visible and indicate that Toyota is on its way to define a new organizational configuration that promises a better fit with a globalized business environment.

Appendix

About the research

As lean production has been theorized over the last three decades by international researchers studying Toyota's activities, we drew on the rich secondary material on Toyota and its internationalization history. In particular, we systematically analyzed press material on Toyota published from 2000–2010 in major business and industry journals. In addition, we intensively studied Toyota's annual reports of that period as well as major academic publications on the *Toyota Way* (e.g. Cusumano 1985; Cole 2011; Liker 2004; Monden 2012; Fujimoto 1999). In addition, we monitored the media, both online and print, on the Toyota recall crisis, and screened academic articles that provided an analysis of the crisis (e.g. Cole 2011; Andrews et al. 2011; Kumar and Schmitz 2011). Both authors also possess extensive experience of researching Toyota and its lean production system, involving field visits to the headquarters in Toyota-City, the Toyota Global Production Center in Motomachi and selected plants in Japan, North America, and Europe, which also contributed to the necessary background knowledge of this case study.

Source		Number	Time frame
Industry journals	Automotive News (including Automotive News Europe)	112	2000–2010
Business press	e.g. Wall Street Journal, Financial Times, The New York Times	87	2000–2010
Annual reports	Annual reports TMC	12	2000–2010
Media reports on the recall crisis	Toyota USA Newsroom, Business Week, The Wall Street Journal, Bloomberg, Blogs.cars.com, Autoblog, Blogs.consumerreports.org, Union of Japanese Scientists and Engineers	252	2010–2012

Authors' contributions
Both authors read and approved the final manuscript.

Competing interests
The authors declare that they have no competing interests.

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